LAUDA

Operating Instructions

Class RA

Cooling thermostats
RA 104, RA 106 and RA 120

LAUDA DR. R. WOBSER
GMBH & CO. KG
Post office box 1251
97912 Lauda-Koenigshofen
Germany
Phone: 0049 (0)9343/ 503-0
Fax: 0049 (0)9343/ 503-222
E-mail: info@lauda.de
Internet http://www.lauda.de

Valid from series 05-0001 (see item 8.3)
10/05
YAEE0018

Safety notes

Before operating the equipment please read carefully all the instructions and safety notes. If you have any questions please phone us!

Follow the instructions on setting up, operation etc. This is the only way to avoid incorrect operation of the equipment and to ensure full warranty protection.

- Transport the equipment with care!
  The unit may NEVER be overturned nor put upside down!
- Equipment and its internal parts can be damaged:
  - by dropping
  - by shock.
- Equipment must only be operated by technically qualified personnel!
- Never operate the equipment without the bath liquid!
- Do not start up the equipment, if
  - it is damaged or leaking,
  - the supply cable is damaged.
- Switch off the equipment and pull out the mains plug:
  - for servicing or repair
  - before moving the equipment!
- Drain the bath before moving the equipment!
- Do not carry out any technical changes on the device!
- Have the equipment serviced or repaired by properly qualified personnel only!

The Operating Instructions include additional safety notes which are identified by a triangle with an exclamation mark. Carefully read the instructions and follow them accurately! Disregarding the instructions may have serious consequences, such as damage to the equipment, damage to property or injury to personnel!

We reserve the right to make technical alterations!

TABLE OF CONTENTS

Safety notes 3

1 SAFETY NOTES 6
1.1 General safety notes 6
1.2 Other safety notes 6

2 BRIEF OPERATING INSTRUCTIONS 8

3 CONTROL AND FUNCTIONAL ELEMENTS 9

4 UNIT DESCRIPTION 10
4.1 Environmental conditions 10
4.2 Unit types 10
4.3 Baths 10
4.4 Pump 10
4.5 Materials 11
4.6 Temperature indication, control and safety circuit 11
4.7 Refrigeration system 11

5 UNPACKING 12

6 PREPARATIONS 13
6.1 Assembly and setting up 13
6.2 Filling and emptying 14
6.3 Bath liquids and hose connections 16
6.4 Connection of external circuits 17

7 STARTING UP 18
7.1 Connection to the supply 18
7.2 Switching on 18
7.3 Set point selection 19
7.4 Warning and safety functions 19
7.4.1 Overtemperature protection and testing 19
7.4.2 Low-level protection 20
7.4.3 Pump motor monitoring 21

8 MAINTENANCE 22
8.1 Cleaning 22

8.2 Maintenance and repair 22

8.2.1 Maintenance of the refrigeration unit 23

8.2.2 Note on repair and disposal 23

Repair and disposal by a qualified refrigeration engineer only! 23

8.3 Ordering spares 24

9 TECHNICAL DATA (ACCORDING TO DIN 12876) 25

10 ACCESSORIES 27

1 Safety notes

1.1 General safety notes

A laboratory thermostat is intended for heating and pumping liquids according to the needs of the user. This leads to hazards by high temperatures, fire, and the general hazards by the use of electrical energy.

The user is largely protected through the application of the appropriate standard specifications.

Additional hazards may arise from the type of material being thermostated, e.g. when going above or below certain temperature levels or through breaking of the container and reaction with the thermostating liquid.
It is not possible to cover all possibilities; they remain largely within the responsibility and the judgement of the user.

The unit must only be used as intended and as described in these Operating Instructions. This includes operation by suitably instructed qualified personnel.

The units are not designed for use under medical conditions according to EN 60601-1 or IEC 601-1 !

1.2 Other safety notes

- Connect the unit only to grounded mains power (PE).
- Parts of the bath cover may reach surface temperatures above 70 °C when operating at higher temperatures. Take care when touching it!
- Use suitable hoses ⇨ Section 6.3.
- Protect tubing with hose clips against slipping off. Prevent kinking of tubing!
- Check tubing from time to time for possible material defects!
- Heat transfer tubing and other hot parts must not come into contact with the supply cable!
- When using the thermostat as circulation thermostat, failure of tubing may lead to leaking of hot liquid and become a danger to personnel and objects.
- When no external consumer is connected to the thermostat the pump outflow must be linked to the return!
- The units are designed for operation with non-flammable liquids to EN 61010-2-010 only.
- Depending on the bath liquid used and the mode of operation it is possible for toxic vapours to be produced. Ensure appropriate ventilation!
- Always pull out the mains plug before cleaning, maintenance or moving the thermostat!
- Repairs on the control unit and the refrigeration system must be carried out by properly qualified personnel only.
- Values for temperature control and indicating accuracy apply under normal conditions according to DIN 12876. High-frequency electromagnetic fields may under special conditions lead to unfavourable values. This does not affect the safety!

Explanation of signs:

	Danger:	This sign is used where there may be injury to personnel if a recommendation is not followed accurately or is disregarded.
	Note	Here special attention is drawn to some aspect. May include reference to danger.
	Reference:	Refers to other information in different sections.

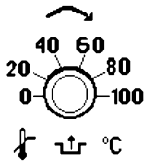
2 Brief operating instructions

This brief instruction shall give you the possibility to operate the unit quickly. For safe operation of the unit it is absolutely necessary to read carefully all the instructions and safety notes!

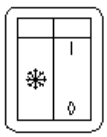
1. Assemble unit and add items as appropriate (⇨ Section 6.)
   The unit may NEVER be overturned nor put upside down!
   Take care of the hose connections (⇨ Section 6.3 and 6.4)

2. Fill the unit with corresponding liquid (⇨ Section 6.3) The units are designed for operation with non-flammable liquids to EN 61010-2-010. → Take care of the level of the bath liquid! (⇨ Section 6.2)

3. Connect the equipment only to a socket with a protective earth (PE) connection. Compare the information on the rating label with the supply details.

4. 

Set the overtemperature cut-out point to a value clearly above ambient temperature (⇨ Section 7.4.1)

5. 

Switch on at the mains switch (green).

6. The refrigeration unit is to be switched on manually (yellow switch), if cooling is needed.

3 Control and functional elements

Reference thermometer

Pilot lamp „Heater“

Pilot lamp „Fault“

Temperature adjustment

Overtemperature adjustment and push button ”Reset”

Mains switch and switch for the cooling unit

Heater

Jet nozzle

Pump connections:
– Return to the bath
– Pump outflow, Pressure output
(⇨ labelling housing)

RA 104 RA 106 RA 120

4 Unit description

4.1 Environmental conditions

The operation of the thermostats is only allowed under the following conditions as specified in EN 61010-2-010:2003 and EN 61010-1:2001:

- Indoor use.
- Altitude up to 2000 m above sea level.
- Foundation must be dense, even, non-slippery and non-flammable.
- Keep clear distance (⇨ Section 6.1).
- Ambient temperature range (⇨ Section 9).
  Use only within this range for an undisturbed operation.
- Mains supply voltage fluctuations (⇨Section 9).
- Maximum relative humidity 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C.
- Transient over voltage according to Installation Categories (Over voltage Categories) II.
- Pollution degree: 2.

4.2 Unit types

The type designation of the Class RA low-temperature thermostats consists of the letter R (identification as low-temperature unit), the control unit A 100 and the type of bath and refrigeration system.

Example: Refrigeration unit R, control unit A 100 and bath and refrigeration system 004 produces thermostat type RA 104.

Type RA 120 is supplied without bath cover. A bath cover is available as accessory.
(⇨ Section 10 Accessories).

4.3 Baths

All units provide a stainless steel bath. The last two digits of the model no. correspond to the approximate total volume in Litre (e.g. bath RA 106 = approx. 6 Litre).

Part of this volume may be used to insert objects.

4.4 Pump

All units are equipped with a pressure pump. The pumps are driven by a shaded pole motor.

The pump outflow connection can be closed without causing any damage to the pump.

Pump characteristics (⇨ section 9 Technical data).

4.5 Materials

All parts which come into contact with the bath liquid are made from high-grade materials appropriate to the operating temperature. Rust-free stainless steel is being used.

4.6 Temperature indication, control and safety circuit

The units are provided with a potentiometer for analogue temperature setting (resolution approx. 0,3 °C). The actual bath temperature is indicated on a reference thermometer (glass) with a resolution of 0,5 °C.

The thermostats are provided with an adjustable overtemperature cut out switch avoiding the operation of the heater in case of an insufficient bath level.

The pump motor is provided with a temperature protector which avoids an overtemperature of the motor. Both functions will switch off heater and pump.

With a P-controller the heating capacity is electronically controlled by a zero voltage packed switching triac.

4.7 Refrigeration system

The refrigeration system consists essentially of a hermetically sealed compressor. Heat of condensation and motor heat are dissipated by a fan-cooled finned condenser. Fresh air is drawn in at the front of the unit, warmed air is discharged at the back and to the sides. The ventilation openings must not be restricted in order to ensure proper air circulation.

The refrigeration system operates continuously to remove a certain amount of heat, with the heater acting in opposition to provide automatically controlled heating power.

The compressors are fitted with a temperature monitor which responds both to the compressor temperature and to the motor current. In addition the cooling system is protected against excessive pressure by a pressure monitor.

When the fault circuit is activated the refrigeration system is also switched off.

Cooling curves (⇨ Section 9 Technical Data).

5 Unpacking

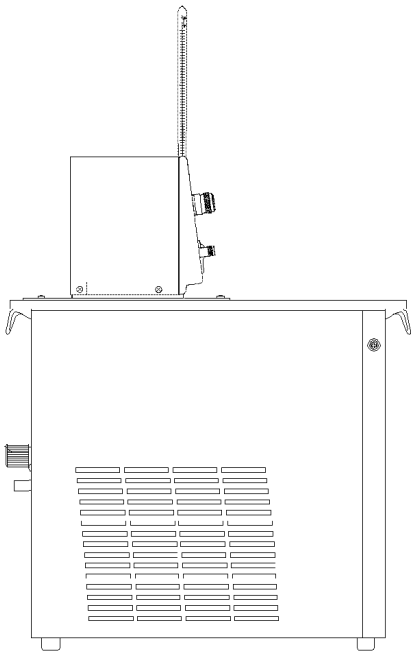
After the unit and accessories have been unpacked they have to be examined for possible transport damage. If there is any damage visible on the unit, the forwarding agent or the post office has to be notified so that the shipment can be examined.

Standard accessories:

Reference number	Quantity	Designation	
ET 034	1	Glass control thermometer -30...+120°C	for all models
HDQ 084	1	Bath cover	only with RA 104
HDQ 085	1	Bath cover	only with RA 106
UD 435	1	Closing plugs	for all models
LZS 001	1	Pump connection link 1m, insulated	for all models
EZB 260	1	Warning label	for all models
YAEE0018	1	Operating Instructions	for all models

6 Preparations

6.1 Assembly and setting up



– Place the unit on a flat surface.

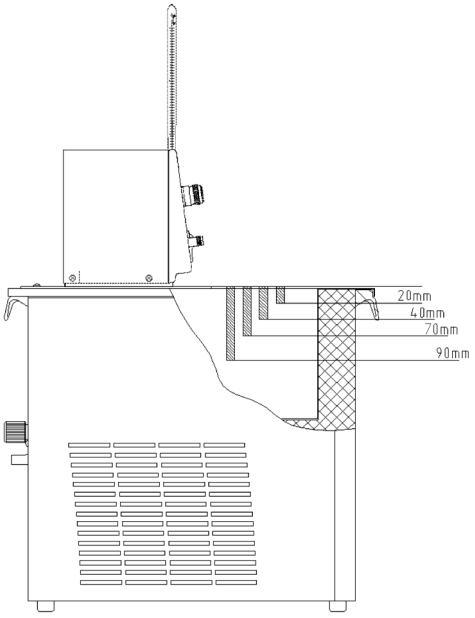
– The unit may NEVER be overturned or put upside down!
– After transport and before starting up, store it standing in upright position for two hours if possible.
– Do not cover the ventilation openings at the back of the unit and its lower part.
– Keep clear distance of at least 40cm.
– Push the reference thermometer into the spring mounting at the right side of the unit.

Operation with external consumer
(circulation thermostat) (⇨ Section 6.4)

– When operating as bath thermostat without external consumer the pump outflow connection has to be linked to the return.
– At bath temperature above 70 °C the label supplied must be affixed on the bath in a clearly visible position!

– The unit can be operated safely up to an ambient temperature of 40 °C.
– Depending on the loading of the refrigeration system, a temporary shut-off can occur, especially in case of an ambient temperature of over 35 °C.
Additionally a higher ambient temperature results in less refrigerating capacity.
– When starting up the refrigeration system after a longer time, it can take up to 30 min, depending on the ambient temperature and the unit type, until the nominal refrigerating capacity is reached.

6.2 Filling and emptying

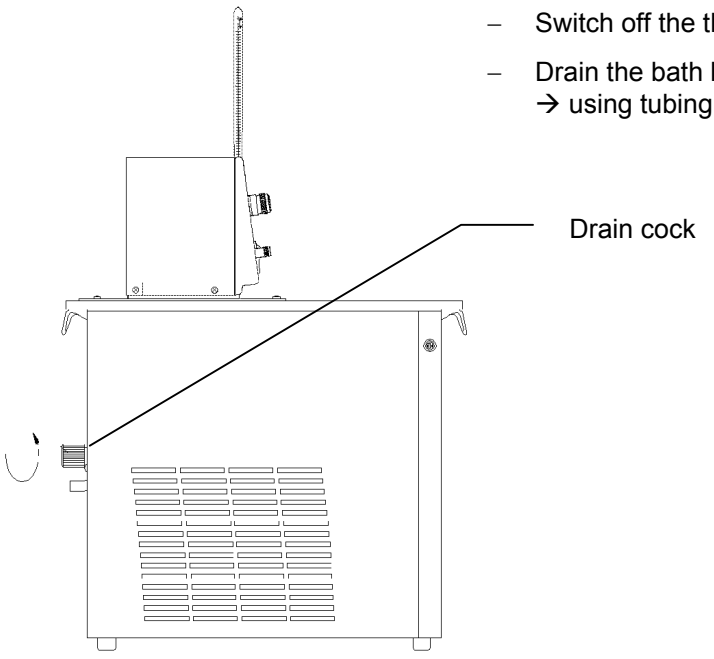


Filling

- Close the drain cock.
- Fill baths up to a maximum level of 20mm below the bath bridge.
- Optimum operation at 20-40mm below the bath bridge.
- Operation is possible down to 70mm below the bath bridge.
- The protection against operation in case of an insufficient bath level operates approx. 90mm below the bath bridge!!!

Emptying

- Switch off the thermostat, pull out the mains plug!
- Drain the bath liquid through the drain cock
  → using tubing.



- The units are designed for operation with non-flammable liquids to EN 61010-2-010.
- When starting up the unit, the tubular heater has to be covered with liquid!
- When connecting an external consumer take care of the bath liquid level for it must not decrease too much → fill in bath liquid if necessary.

Do not drain the thermostating liquid when it is hot or very cold (below 0°C)!

6.3 Bath liquids and hose connections

Bath liquids

LAUDA Designation		Working-temperature range	Chemical Designation	Viscosity (kin)	Viscosity (kin) at temperature	Fire point	Ref. No.: Quantity		
	Former designation	from °C to °C		mm²/s at 20°C	mm²/s		5 l	10 l	20 l
Aqua 90 ①	Water	+5...+90	deionised water	1	--	--	LZB 120	LZB 220	LZB 320
Kryo 30 ②	G 100 ②	-30...+90	Monoethylen-glycol/water	4	50 at -25°C	--	LZB 109	LZB 209	LZB 309

① At higher temperatures → Evaporation losses → Use bath covers (⇨ Section 10 Accessories). Distilled water or fully deionised water must only be used with the addition of 0,1g sodium carbonate (Na_2CO_3) /litre water, otherwise → danger of corrosion!

② Water content falls after prolonged operation at higher temperatures → mixture becomes flammable (flash point 128 °C) → Check the mixture ratio with a dosimeter.

Safety data sheets are available on request.

Hose connections

Tubing type	Int. dia. Ø mm	Temperature range °C	Application	Ref. No.
EPDM-tubing, non-insulated	9	10...120	for all bath liquids except for Ultra 350 and mineral oils	**RKJ 111**
EPDM-tubing non-insulated	12	-60...120	for all bath liquids except for Ultra 350 and mineral oils	**LZS 019**
Silicone tubing, insulated	9	-60...100	for all bath liquids	**LZS 001**
Silicone tubing non-insulated	4	0...100	for all bath liquids	**RKJ 041**

- EPDM-tube is not suitable for Ultra 350 and not suitable for mineral oils!
- Silicone oil causes pronounced swelling of Silicone rubber → never use Silicone oil with Silicone tubing!
- Protect tubing with hose clips against slipping off!

6.4 Connection of external circuits

Operation as circulation thermostat

- When used as circulation thermostat, care for shortest hose connections with largest inner diameter as possible. This gives the best flow.
- Connect 9mm int. dia. tubing (⇨ Section 6.3) to the pump connector.
- Pump connections
  – return to bath
  – pump outflow, pump pressure
  (⇨ labelling housing).

- If the cross-section of the tubing is too small → temperature drop between bath and external system due to low flow rate. Increase the bath temperature appropriately.
- Always ensure the maximum possible flow cross-section in the external circuit!

- When the external consumer is placed at a higher level than the thermostat the pump is stopped and air penetrates into the thermostating circuit the external liquid may drain down into the bath even with a closed system → danger of flooding the thermostat!
- Protect tubing with hose clips against slipping off!!
- When no external consumer is connected to the thermostat, the pump outflow connection must be linked to the return.

7 Starting up

7.1 Connection to the supply

Compare the supply voltage against the data on the rating label.

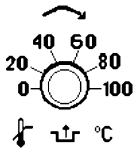
Model according to EMC directive EN 61326-1 class B (industrial and domestic areas), if the nominal current of the current feeding point is >100 A. Otherwise only according to class A (industrial areas only).*

- Connect the unit only to a grounded mains power socket (PE).
- No warranty when the thermostat is connected to a wrong supply!
- Please make sure that your mains plug is equipped with at least the following safety fuses.

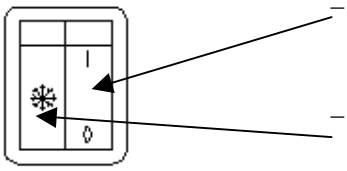
Power supply	Fuse protection
230V	16A
208V	15A
115V	15A

- The start current of the refrigerating machine may exceed those currents distinctly for a short time.
- Without external circuit ensure that the pump pressure outflow is closed or linked to the pump return.
- Ensure that the unit is filled in accordance with Section 6.2.

7.2 Switching on



- Set the overtemperature switch-off point to a value clearly above ambient temperature.

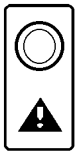


- Switch on at the mains switch. The green light for "Supply ON" lights up.
- Additionally switch on the cooling unit (yellow switch), if cooling is needed.

- Indication of the current bath temperature on the reference thermometer.

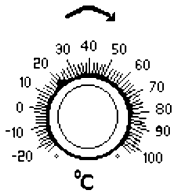
- If necessary add more bath liquid to replace the amount pumped out to the external circuit.

** Notice only valid for EU countries*

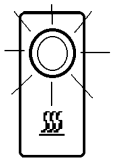


– If the pilot lamp ”Fault” lights up
→ Adjust the overtemperature switch off point at a higher temperature, then reset by pressing the turning knob (Overtemperature adjustment and ”Reset” button).

7.3 Set point selection



– Adjust the desired set point with the button for the temperature adjustment (resolution approx. 0,3 °C).



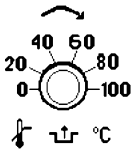
– When the set point is reached the pilot lamp ”Heater” flashes.

– Check at the reference thermometer if the bath temperature corresponds to the selected set point → readjust set point if necessary.

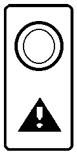
7.4 Warning and safety functions

7.4.1 Overtemperature protection and testing

– The units are designed for operation with non-flammable liquids to EN 61010-2-010.



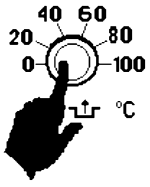
– Set the overtemperature switch-off point. Recommended setting 5 °C above required bath temperature.



– When the bath temperature arises above the overtemperature switch-off point, the pilot lamp “Fault” flashes.

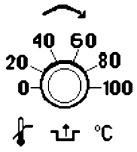
– The heater and the pump are switched off.

– Wait until the heater has cooled down under the switch off point, rectify the fault (liquid level too low, faulty control, failure of tubing);
then

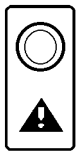


– reset by pressing the button.

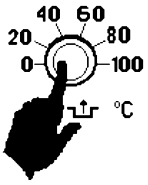
– Before the unit is running unattended for longer periods the **overtemperature protection** should be tested. **Therefore**



– turn the potentiometer slowly anticlockwise. → The unit must switch off at the bath temperature.



– Red pilot lamp „Fault“ flashes.

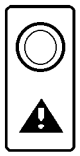


– Readjust the overtemperature switch off point to a value above bath temperature and reset by pressing the button.

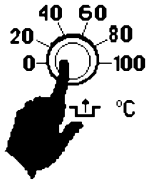
– If the unit does not switch off when testing the overtemperature protection, switch off the equipment immediately and pull out the mains plug!

– Have the equipment checked by the **LAUDA service** or the local service organisation!

7.4.2 Low-level protection



1. If the liquid level drops so far, that the tubular heater is no longer covered with liquid and heating starts the red pilot lamp ”Fault” flashes . Heater and pump are switched off. (Protection against operation in case of an insufficient bath level).
2. Refill the bath (⇨ Section 6.2) or rectify the fault (failure of tubing etc.).
3. Reset with the button.



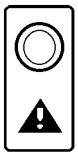
– If there is any irregularity when testing the safety devices, switch off the unit immediately and pull out the mains plug!

– Have the unit checked by the **LAUDA service** or the local service organisation!

– The heater surface can reach temperatures up to 250 °C when there is not enough liquid in the bath → Danger of burning injuries. Use only non-flammable liquids, otherwise→ Danger of fire!

7.4.3 Pump motor monitoring

– In case of pump motor overload or a blockage the heating and the pump are switched off.



– Red pilot lamp „Fault“ flashes.

– After motor has cooled down the thermostat starts up again automatically.

8 Maintenance

8.1 Cleaning

Before cleaning the unit, pull out the mains plug!

The unit can be cleaned with water adding a few drops of detergent (washing up liquid), using a moist cloth.

Water must not enter the control unit!

- Carry out appropriate detoxification if dangerous material has been spilled on or inside the unit.
- Method of cleaning and detoxification are decided by the special knowledge of the user. In case of doubt please contact the manufacturer.

8.2 Maintenance and repair

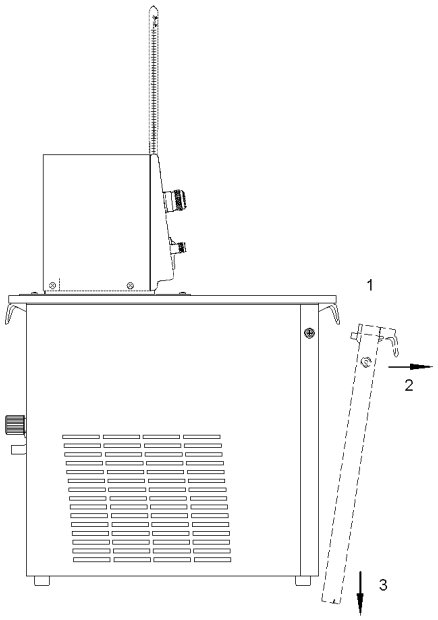
- Before any maintenance and repair work pull out the mains plug!
- Repairs on the control unit must only be carried out by properly qualified personnel!

LAUDA thermostats are largely maintenance-free. If the thermostating liquid becomes dirty it has to be replaced (⇨ Section 6.2).

- If a fuse blows (→ supply indication not alight) fit only fuses as specified (Bath/Circulation thermostats F8A, size 5 x 20 → fuses are accessible from the outside).

8.2.1 Maintenance of the refrigeration unit

The refrigeration unit operates largely without maintenance. Depending on the ambient dust conditions and the operating time, any dust on the heat exchanger (condenser) must be removed at intervals on 2 weeks or longer. This is done after taking off the front grille. Brush off the condenser and if necessary blow through with compressed air.



8.2.2 Note on repair and disposal

The refrigeration circuit is filled with a CFC-free refrigerant. Type and charging quantity are indicated on the unit.

Repair and disposal by a qualified refrigeration engineer only!

Before the equipment is being returned to the factory, it is recommened to contact our technical service.

☞ – If the equipment has to be returned to the factory, please ensure that it is carefully and properly packed. LAUDA accepts no responsibility for damage due to unsatisfactory packing.

8.3 Ordering spares

When ordering spares please quote instrument type and serial number from the rating label. This avoids queries and supply of incorrect items.

The serial number is combined like following, for example **LCK0904-06-0001**

LCK0904 =	Article order number/ Ref. No.
06 =	manufacturing year 2006
0001 =	continuous numbering

Your contact for service and support

LAUDA Service Centre
Phone: +49 (0)9343/ 503-236 (English and German)
E-mail service@lauda.de

We are available any time for your queries, suggestions and criticism!

LAUDA DR. R. WOBSER GMBH & CO.KG
Post office box 1251
97912 Lauda-Koenigshofen
Germany
Phone: +49 (0)9343/ 503-0
Fax: +49 (0)9343/ 503-222
E-mail info@lauda.de
Internet http://www.lauda.de/

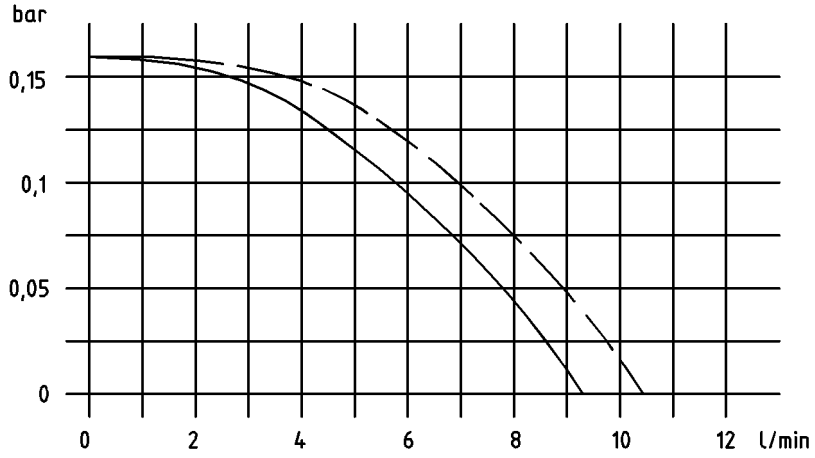
9 Technical data (according to DIN 12876)

			RA 104	RA 106	RA 120
Operating temperature range		°C	-10...100	- 20...100	- 20...100
Ambient temperature range		°C	5...40		
Setting resolution		°C	0,3		
Indication accuracy		°C	±0,5		
Temperature control		± °C	0,05		
Safety features			NFL (suitable for non-flammable liquids)		
Heater power		kW	1,5		
Cooling capacity (eff.) at 20°C ambient temperature	20°C 0°C -10°C -20°C	kW	0,18 0,12 0,05 ---	0,20 0,15 0,10 0,05	0,35 0,25 0,18 0,10
Pump type			pressure pump		
Max. discharge pressure		bar	0,15		
Max. flow rate ②		l/min	8		
Pump connections		mm	nipples Ø 8 mm		
Max. bath volume		l	3...4,5	4...6	14...20
Bath opening (W x D)		mm	130x105	150x130	300x350
Bath depth		mm	160	160	160
Usable depth		mm	140	140	140
Height top edge of bath		mm	363	396	441
Overall size (W x D x H)		mm	180x320x524	200x400x557	350x530x602
Weight		kg	19	23,5	40
Mains power supply ②		V; Hz	See -Ref. No. below protection class 1 to DIN VDE 106-1		
Power consumption	230 V; 50/ 60Hz 230 V; 50 Hz	kW	1,7 ---	1,8 ---	--- 2,0
Ref. No.	**230V±10%; 50/60Hz 230V±10%; 50Hz**		**LCK 0904 -----**	**LCK 0905 -----**	**----- LCK 1906**

Units to EU Directive 89/336/EWG (EMC) and 73/ 23/ EWG (low-voltage) with CE-mark.

We reserve the right to make technical alterations!

Pump characteristics:



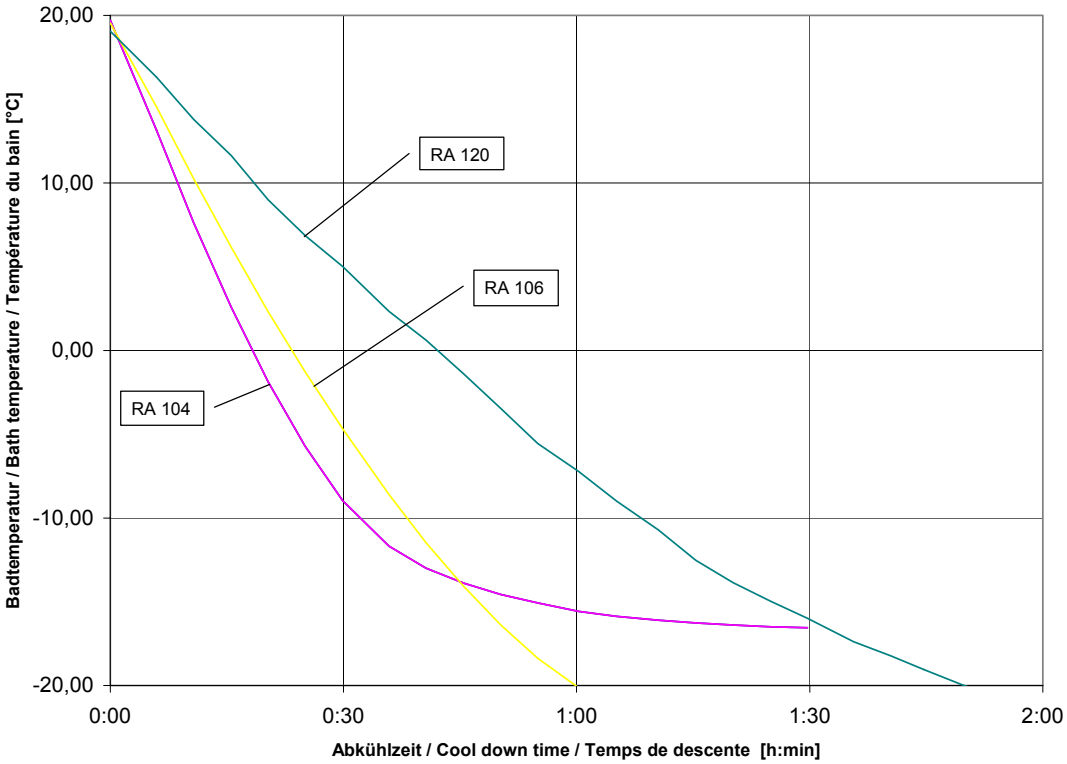
compact thermostat

Immersion thermostat

measured with water

Cooling curve

measured with ethanol



Bath liquid:

water/glycol 1:1
(to -25°C) as bath liquid

Time from graph:

= x1,7

10 Accessories

Accessories	suitable for	Ref. No.
Bath cover two parts	RA 120	LCZ 0633
Gable cover	RA 120	LCZ 011
Rising platform 8 steps	RA 106	LCZ 0646
Rising platform 8 steps	RA 120	LCZ 0635
Tubing clamp stainless steel		EZS 012

For further accessories please contact us.

BESTÄTIGUNG / CONFIRMATION / CONFIRMATION

An / To / A:
LAUDA Dr. R. Wobser • LAUDA Service Center • Fax: +49 (0) 9343 - 503-222

Von / From / De :

Firma / Company / Entreprise: _____

Straße / Street / Rue: _____

Ort / City / Ville: _____

Tel.: _____

Fax: _____

Betreiber / Responsible person / Personne responsable: _____

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):
We herewith confirm that the following LAUDA-equipment (see label):
Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

Typ / Type / Type :	**Serien-Nr. / Serial no. / No. de série:**

mit folgendem Medium betrieben wurde
was used with the below mentioned media
a été utilisé avec le liquide suivant

_____

_____

_____

_____

Darüber hinaus bestätigen wir, daß das oben aufgeführte Gerät sorgfältig gereinigt wurde, die Anschlüsse verschlossen sind, und sich weder giftige, aggressive, radioaktive noch andere gefährliche Medien in dem Gerät befinden.

Additionally we confirm that the above mentioned equipment has been cleaned, that all connectors are closed and that there are no poisonous, aggressive, radioactive or other dangerous media inside the equipment.

D'autre part, nous confirmons que l'appareil mentionné ci-dessus a été nettoyé correctement, que les tubulures sont fermées et qu'il n'y a aucun produit toxique, agressif, radioactif ou autre produit nocif ou dangeureux dans la cuve.

Stempel **Seal / Cachet.**	**Datum** **Date / Date**	**Betreiber** **Responsible person / Personne responsable**

LAUDA DR. R. WOBSER GmbH & Co. KG
Pfarrstraße 41/43
D - 97922 Lauda-Königshofen
Internet: http://www.lauda.de
Tel: +49 (0)9343 / 503-0
Fax: +49 (0)9343 / 503-222
E-mail: info@lauda.de